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Cockrell School of Engineering

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## *Enhanced Education* How technology changing the way we study

Engineering is a global profession. Regardless of your specific major, particular interests, or skill sets, there will always be a place in the world for you. While our careers may take us all over the world, we are very lucky to build and solidify our foundations at The University of Texas at Austin's Cockrell School of Engineering.

This winter issue of Vector revolves around the theme of a global engineer. Although we may come from many different places, we share a common bond of which we can be proud. Whether you are an avid fan of traveling or an individual who prefers the security of home, there will always be great career opportunities open in both the international and domestic markets. As a student, there are also excellent chances to explore your options overseas, whether it be through a study abroad program or an international internship. By experiencing as much as you can before graduation, you can maximize your chances of finding something that you truly enjoy; something that you will be proud to call your career.

In the spirit of celebrating the diversity within engineering, this issue includes interviews with various international students who have come from far and wide to study at the Cockrell School, professional input from a traveling engineer, and the various international opportunities available to students at UT Austin.

All that aside, it is important to remember that the skill set of an engineer is a commodity that can be marketed, utilized, and respected all over the world. The fact that students come from around the globe to study at the Cockrell School speaks volumes about the quality of UT Austin's engineering program. It is this quality that allows us to go everywhere and anywhere with the highest level of professional respect and pride.

What starts in the Cockrell School can and will change the world.

Enjoy,

Richard Fang & Anvita Jain  
Editors-in-Chief  
vector@sec.engr.utexas.edu

### STAFF

#### Editors-in-Chief

Richard Fang  
Anvita Jain

#### Copy Editors

Lucy Xie  
Nathan Houk  
Sandra Parades

#### Layout Editors

Arlene MacArthur  
William Yang  
Dmitriy Marakyan

#### Photography

David Sternberg  
Alex Garn

#### Staff Writers

William Yang  
Kristen Siegele  
Elizabeth Joy  
David Conrad  
Zach Chow

#### Publicity

Khushbu Patel  
Annie Xue  
Bryan Nguyen  
Henry Merschat

#### Administrative Chair

Jenny Ding

#### Staff Advisor

Olivia Knox

Vector is the student engineering magazine on campus. Published by the Student Engineering Council, Vector is completely written, managed, and designed by students for students. With issues dating back to 1971, the magazine has a long-standing tradition of serving as the voice for engineering students at the University of Texas at Austin. The Vector staff publishes two issues per semester.

For more information regarding the Vector magazine, please contact us at vector@sec.engr.utexas.edu.



# FLIPPED CLASSROOM

Professor Ernst-Ludwig Florin gives his take on a new way of teaching.

By: Zach Chow

The new flipped classroom teaching style inverts traditional teaching methods by delivering instructions online outside of class and moving “homework” into class. I sat down with Professor Ernst-Ludwig Florin on his recent transition to the flipped classroom model.

What made you decide to try flipped class?

In the past, students in my lectures had often been lacking the effort to participate and pay close attention to the materials that were being taught. Students were occasionally falling asleep and they were not learning. However, when I sat in on a flipped class lecture of one of my fellow colleagues Dr. Rodenborn, I noticed that a majority of his students were attentive to what he was saying. After experiencing Dr. Rodenborn present the flipped class teaching method, I came to a realization that students need to be engaged in order to learn. To the students, lecturing was uninteresting. A student that is learning new material only has an attention span of about 20 minutes. In a lecture of 50 minutes, the students often get lost and uninterested in the topic. In this new flipped classroom model, I can engage them.



Do you enjoy using flipped class? Do you feel like you have more time?

I believe if students are able to come into a classroom with the general knowledge of the topic at hand, they are able to see that same material in a different light. Learning the material before hand prodigiously benefits students by allowing them to realize where the difficulty lies when I re-emphasize the topic with iClicker questions. If they can put in the effort to learn outside of class, they are able to understand the problem and explanation better. If they had never thought about the problem before, then it is harder for them to comprehend the solution later. Initially students could follow the problem, but not solve by themselves. The flipped classroom permits me more time to give examples

and explain them the solution so the students can independently solve these problems in the future.

What kind of results are you seeing? Improvement? The Flipped Classroom teaching method allows me to emphasize what the students read in the book, but in a different interactive light. Most students now are paying attention to the examples that I give to them and fewer students are falling asleep in my lectures.

## Student Opinions on the Flipped Classroom



“It’s certainly a challenge to do the learning on your own, but I found that once I got into a routine it became much easier. Also, if the professor knows what they are doing, the classroom work can be very effective, especially if working in groups.”

“You don’t have to be as worried about missing a class because you have all the lectures and stuff, you just missed some classwork time. I think a flipped curriculum can be very effective in certain settings, but in others it is a little more difficult. It depends on the individual’s preferences.”

“Flipped classrooms are okay once you get used to the idea that you’re paying \$10k in tuition for a computer to teach you.”

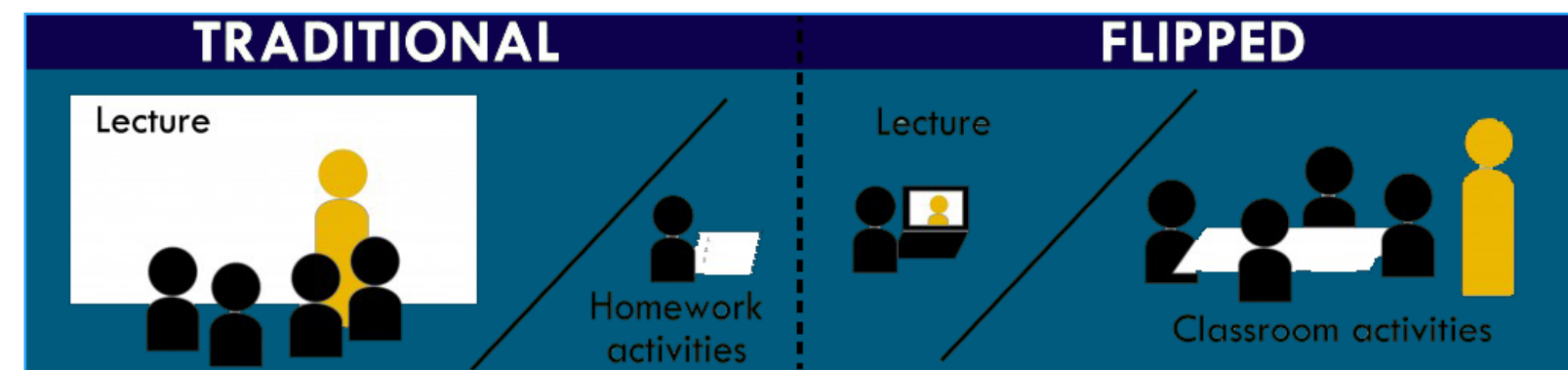
“I think if a class is a flipped class, it should be stated as such on the course schedule so the students know what they are registering for. I was so worried that my one of my math classes was going to be flipped, and I had to plan a backup schedule in case it was because I knew I could not learn M408C last semester on my own. If the type of class was noted on the course schedule, it could save us all some panic.”

“I think the flipped classroom only works if the professor uses it as a supplement to his or her teachings. I definitely had a professor who seemed like he used the modules and online learning as an excuse not to teach.”

“The criteria for a class should be ‘how students learn best with the same time the professor devotes.’ Students learn best when they’re actually taught material in a classroom or lecture hall rather than having to learn themselves. Often times when students are introduced to and understand the basic concept from class, they are fine refining those skills with their own studying later on. A flipped classroom forces students to learn themselves which often leaves them confused and unable to ask questions until office hours or asking someone else.”

“I actually really like it because my professors have posted long and thorough videos that explain the material better than the lectures do. And I could pause the videos and take a break if I get too overwhelmed or too tired, but I can’t really do that in lecture. I feel like it depends on the professors and what resources they include within the learning modules and on their quest page in general.”

“I think having a few materials online as prep homework or reading and having the professor lecture over it during the next class really helps to reinforce the concepts. It also provides a place of reference as students study so it is easy to look up notes that a student might have missed. However, there are professors who teach whole lectures through these modules and do not lecture on the topic. This does about as much good as reading solely the textbook and taking a quiz or exam on that unit without instructor interaction.”





# Valuations: Engineering in Other Contexts



By: Richard Fang

To be an engineer is to be a technical expert in your field of choosing, whether it be chemical, petroleum, mechanical, or a whole host of other specializations. More often than not, these specialists move on to careers in their respective fields: the chemical engineer may go on to work for a huge chemical firm like BASF and the petroleum engineer may go on to work for a huge oil & gas firm like Shell. These are undoubtedly amazing career paths to follow, there are options that many students and professionals either are not aware of or do not consider.

The unique skillset that engineers have is invaluable in the business world. Valuation is a specialized field that is closely linked to consulting. Essentially, a specialized engineer is needed when a consulting or advisory firm is required to have some technical knowledge about a client or business partner. These situations may range from mergers and acquisitions to financial statement audits. Public accounting firms like Ernst & Young or Grant Thornton hire third-party engineers to assist them when they are required to perform audit or advisory services to technical clients like ConocoPhillips. An auditor most likely does not know, and is not expected to know, how to evaluate the technical assets that an oil & gas firm has. How is an auditor or advisor with a business background supposed to value equipment that is specialized for engineers within a certain industry?

In these scenarios, large business-oriented firms rely on an engineer's technical expertise to properly and efficiently value a client's assets, revenues, or whatever else needs a specialized mind to evaluate. While careers like this are not the first thing to come to mind when considering engineering, they are certainly worth pursuing. In addition to gaining knowledge and exposure to various huge companies, a career in valuation or consulting continually challenges the mind and prevents monotony and boredom during work.



# FORENSIC ENGINEERING

By: Arlene MacArthur

According to the National Academy of Forensic Engineers (NAFE), forensic engineering is the "application of the art and science of engineering in matters which are in, or may possibly relate to, the jurisprudence system, inclusive of alternative dispute resolution." In other words, it is the investigation of materials, structures, or other such components that fail to operate as intended and cause either damage to property or persons. Forensic engineers perform tasks similar to those of crime scene investigators in that they both collect and analyze data from crime scenes, study this data in a crime lab, write reports of their findings, and testify in court. They gather evidence in order to work back to identify the sequence of events leading to the failure, and to determine where the fault lies.

If this is a career that interests you, the good news is that you do not need to change your major. All you need to have is at least a Bachelor's degree in engineering, and become a licensed engineer in the state in which you live, to be eligible for the training and

examinations required to become a forensic engineer. This means it is a good option if you want to change your career later in life, after you have experience in the field in which you received your degree.

Forensic engineers can work in many different environments and with many different types of problems, including but not limited to structural failures, automobile and

**Forensic engineers perform tasks similar to those of crime scene investigators in that they both collect and analyze data from crime scenes, study this data in a crime lab, write reports of their findings, and testify in court.**

Graduates who earn a Bachelor's degree in engineering make some of the highest salaries in the job world, and forensic engineering is no exception. Salaries for forensic engineers ranges from \$66,000 to \$99,000 per year, according to the Bureau of Labor Statistics.

aviation accidents, appliances, consumer products, and medical devices. If solving these types of engineering puzzles is something that interests you find interesting, then forensic engineering might just be for you!



# Learning 2.0

## How technology is changing high education

It seems like only a few years ago that the prevalent technologies in a classroom were chalkboards and overhead projectors. And while I haven't seen an overhead projector in forever, the chalkboard still manages to cling on as an irreplaceable classroom component. Technology is evolving at a breakneck speed, and classrooms around the world are changing in response. Online classes, mass cloud storage and sharing, and an assortment of computing devices (whether it be a smartphone, laptop, or tablet) have already changed how the average classroom looks. New and upcoming technologies like the smartboard will continue to allow classrooms to adapt to the future.







# Chevron Interview

By Henry Merschat

Karina Pieratt is a third-year Mechanical Engineering major who participated in an internship with Chevron during the summer of 2013. Vector got a chance to speak with her about her experience with such a big-name company.

## First off, could you describe your position and responsibilities while you were interning with Chevron?

My internship was really nice; I was with the subsea department. It's kind of an up-and-coming field so there were only about five interns working on it. I was on two projects the whole summer. One was computer programming and the other was mostly field related and ended up involving a lot of background work on subsea technology.

## What was it like working at such a large company?

I liked it because there was always so much going on and someone with the same interests as you. And if you didn't like what you were doing, for example if I hadn't ended up liking subsea, you could just email someone to talk about finding something you were more interested in. It was similar to UT in that with such a large company

you're definitely going to be able to find a niche doing something you enjoy.

## Why did you choose to work for Chevron?

Well, I only had one other offer, but I was really interested in working with that subsea department because I've always had an interest in underwater technology. So it was really about what I was going to be doing. Regardless of the company, you're not going to enjoy it unless you're doing something you want to do.

## Do you feel like you were able to apply what you learned on your internship at UT or what you've learned at UT to your internship?

Yeah, I had no idea Excel was so awesome; it's crazy! I learned a ton of Excel skills working at Chevron and I've been able to use that here. As far as school helping me with the internship, my computing class helped some with the programming I was doing, but my project wasn't super technical because it was only the summer after my sophomore year.

## Could you see yourself working for Chevron in the future?

Chevron is a fantastic company, and it's huge, so you can do all of the networking and make all of the connections you could ever need, but I never really thought working for an oil and gas company was something that I would be very interested in. I don't know that I'll ever necessarily go back to Chevron, but I definitely see myself working for a big company in the future. I liked the big company feel.

## So would you say that Chevron lived up to the hype surrounding its name?

Oh yeah, they treated us super well. Like the second day I was there they took us to Louisiana just to visit other people in their subsea department. It was really great, and they really take care of all of their workers.

## Is there any advice you would have for other students seeking internships with big-name companies?

I would just say go for it. A lot of people get scared when they think about these companies, like "they're not going to think anything of me." And go into interviews excited. There's no reason to be scared, the interviewers are just people like you.

# Technology in the Classroom

By Leslie Zhang

It's not unusual for us to look up in the middle of class and notice the reflection of a bright LED screen on the face next to us. Naturally, our attention flickers to the screen goes back to the lesson on the projector screen. Technology has become ubiquitous inside and outside of classrooms, redefining the way we teach and learn.

Technology has made its way into classrooms beyond mobile devices, iclickers and course management systems. Petroleum and Geosystems lecturer Deborah Hempel-Medina, who teaches Engineering Communications, introduces students to teleconferencing presentations in her course. "We split the class in half and have half the room present in CPE and half present in a room in ETC," Hempel Medina said. "We have three teams on each side presenting across the way then flip so they have a different venue."

While teleconferencing may be a convenient alternative to in-person meetings, Hempel-Medina said that the students in the audience may not feel engaged and will often forget they are active participants. "What the students say is 'I couldn't see who was paying attention I couldn't get

any feedback,'" Hempel-Medina said. "Teleconferencing isn't going to eliminate in-person meetings if the team is struggling to form or having lot of disagreement. You don't get to see body language, eyes roll, how the message is being received or not." Anthony Petrosino, Curriculum and Instruction associate professor, said many of us overlook today's omnipresence of technology, which have assisted with communications between people on both sides of the classroom.

"Course management systems have allowed a great deal of interaction, portability and communication between professors and students that was very challenging—if not very difficult—a short time ago," Petrosino said.

In facilitating communication, however, he said technology may have distanced us from in-person student-professor interactions. "There are challenges involved because what you want to make sure is the technology doesn't get in the way of personal interactions students have with professors," Petrosino said. "For instance, it might be easier to email a professor than to come to office hours."

Having recently graduated, Mark McClure, Petroleum and Geosystems assistant professor, said he uses his tablet to write on his class PowerPoints, allowing him to combine the mediums of digital PowerPoints with hand-written lecture notes.

"I like to put up my PowerPoint presentation and I have a stylus so I can actually write on top of the PowerPoint," McClure said. "When I was a student, people used PowerPoint or chalkboard. They didn't combine the two things."

While technology integration is hardly predictable, the area of data visualization has gained steam recently according to Petrosino.

"The ability for students to analyze real data in real time is very very exciting," Petrosino said. "There're numerous databases that make use of this... That's an exciting area between interfaces and the use of data in modeling. The visualization of data is the new area we're going to see explode in instruction and in student learning."



# EE 319K Electrical Engineering Embedded Systems

By Leslie Zhang

This January, the University of Texas at Austin offered for the first time an online version of its electrical engineering embedded systems course (EE319K, if you're a fan of the jargon). In the fall of 2012, the UT system was the fourth to join EdX, an online Massive Open Online Course platform founded by MIT and Harvard which offers free, non-credit courses to the public.

Electrical engineering Professor Jonathan Valvano, who teaches the embedded systems course on EdX with electrical engineering lecturer Ramesh Yerraballi, said that education is changing from a traditional, classroom setting and teaching an online course allowed them to be on the forefront of change.

"There was a call for proposals and we decided someone's going to do it—why not us?" Valvano said. "That's really the mission of a flagship school of the state of Texas."

The lab-based course, titled "Embedded Systems—Shape the World," uses a hands-on approach to building embedded systems with a Texas Instruments microcontroller kit.

"If we're going to transform the way we do education, we're going to need to train

people to do things with their hands, their elbows, their fingers," Valvano said. "This was an attempt to provide a real lab experience; we're talking wires, bolts, measurements, building, not working, and doing it again—interactive hands on experience for the masses."

Taking course materials into consideration, Valvano said the inexpensive nature of the lab components allowed the embedded systems course to be offered online.

**"If we're going to transform the way we do education, we're going to need to train people to do things with their hands, their elbows, their fingers..."**

"Turns out, embedded systems is much easier to do than organic chemistry," Valvano said. "In embedded systems, the platform around which you build is really inexpensive. Embedded systems is a fancy [term] for small computer. The whole laboratory

bench is only \$30-\$40."

According to Valvano, one of the challenges of teaching the EdX course has been recording lectures without mistakes in contrast to delivering one-time lectures in a traditional classroom setting.

"We had no idea how much work this would be" Valvano said. "I've been teaching for 30 years. This is ten times the work of teaching a new class. When you deliver a lecture and you're flawed, you're done. But when you deliver a lecture on video, you do it again and again. The other thing is, because [students] don't have the opportunity to come to your office to get a clarification, you can't look at them and ask them what's wrong, the intent is to organize it in a way that's approachable."

Though teaching the online version of the embedded systems course has required more time than he expected, Valvano said he is excited by the large number of students enrolled in the course.

"We're very passionate about teaching and if you count up in a 30-year career how many people you can reach, you get a fairly large number, but not as large a number as teaching this thing once," Valvano said.

# Engineering Virtual Desktop AppD

By Elizabeth Joy

The Engineering Virtual Desktop, also known as AppD, is an advanced desktop infrastructure that can be used to access software like MATLAB, LABView, COMSOL, AutoCAD, any many more programs needed for engineering classes free of charge. In addition, engineering students can access their personal engineering home directories and use the desktop for data storage for up to 1 GB data. For non-engineering students, there is a university-wide Virtual Private Network service, which is available to anyone with a high assurance UT EID. Although this network does not provide any of the engineering-related software as the Engineering Virtual Desktop, the Virtual Private Network enables users to access network shares and print from off-campus.

All engineering students can download the virtual desktop program from the engineering website at <http://www.engr.utexas.edu/itg/facilities/virtualdesktop>. First-time users will need to request virtual desktop access before being able to use the desktop. After receiving approval, the student will login to the desktop with their EID and password and proceed to the download page. On this page, the student will install the workspace client that is appropriate for his/her computer's operating system. After setting up the program, the student can connect to the virtual desktop anytime using a web browser.

The virtual desktop comes in handy to finish assignments which require the use of expensive software only available at the engineering computer labs. Architectural Engineering student Sena Esrefoglu learned about the virtual desktop from a flyer that was posted in one of her classes. Ever since, she has been using the virtual desktop for Revit and AutoCAD. When asked to share her experience using the virtual desktop, Sena responded, "What I like most is just having the convenience of working on a project whenever I want and not having to walk to a different building. Also, instead of installing all of these programs and having it take up space on your computer, you only install one application and have access to everything." Samantha Kambo, sophomore Architectural Engineering student, also uses the virtual desktop for Revit and AutoCAD. She had heard about the desktop from one of her teaching assistants. Samantha comments, "I really like being able to access my files whenever I need to work on things outside of campus. Because of this, I was extremely productive over Spring Break!" Samantha adds, "It is super beneficial to be able to work on design projects at home when I don't have enough time to finish something in class."

Like any other technological application, the virtual desktop does have its drawbacks. Unfortunately, the desktop is not able to provide all the software needed for every

engineering class simply due to the higher licensing costs and the reduced packaging portability. Civil Engineering student Jeff Nagy has commented that there were limited programs available through the virtual desktop. A second drawback of the virtual desktop is the complicated setup process needed to launch the virtual desktop on a personal computer. When asked what she would like to change about the engineering virtual desktop, Samantha remarked, "It would help if the instructions were a bit more detailed on the site, or a video was posted to help clarify the process." For students who are having trouble launching the engineering virtual desktop on their laptops, Samantha advises, "If you have any issues like I did initially, the ITG Service Desk should be able to help." Another area for improvement is the speed at which the virtual desktop loads on startup. When asked to name a disadvantage of using the virtual desktop, Sena comments, "It lags a little sometimes, but that's to be expected."

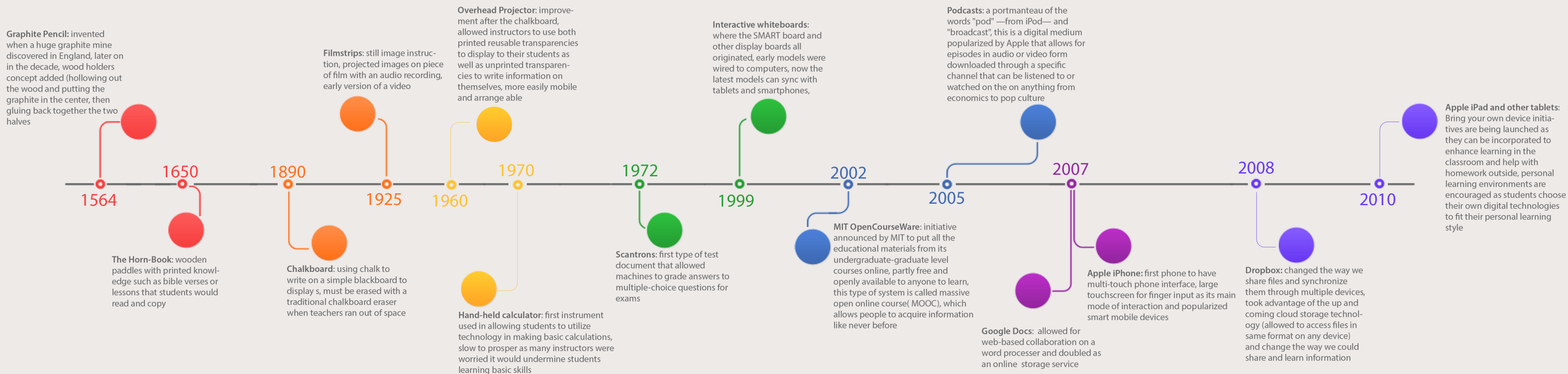
Overall, the virtual desktop provides a convenient and reliable way to access software required for the vast majority of UT engineering classes. The virtual desktop saves students money needed to buy the software and time taken to travel to the engineering computer labs. Despite its drawbacks, the virtual desktop is a useful application that provides considerable flexibility for students.



# technology in the classroom.

by: Annie Xue

we all know that the development of technology is crucial to our everyday lives.  
but how do past and present technologies affect the way we learn and the structure of the classroom?  
the following timeline shows the evolution of technology in the classroom and on campuses throughout the years.







# Longhorn Band

By Henry Merschat

Long ago, before I had actually taken any classes at The University of Texas or even stepped onto the Forty Acres for more than a few hours at a time, I spoke with my academic advisor about the possibility that I might join the Longhorn Band, an organization that I am now a part of. She told me in a passing comment that over forty percent of the band is comprised of engineering students, a surprising ratio considering engineering students only make up about fourteen percent of the university. Since then, I've put a lot of thought into correlations between engineering studies and musical training.

Perhaps the most important skill that a student learns in band is time management. Marching band sectionals and practices can take up two to three hours a day during the week. Furthermore, football games and weekend performances are generally all-day affairs. In the words of Electrical Engineering sophomore and bass drum player Joey Jacobus, "if you're not on top of everything between school and band, you're just not going to get your stuff done. There aren't enough hours in the day." He went on to say that his grades are even better in the fall, when Longhorn band is in full swing, than in the spring when he has more time on his hands. "In the spring I have too much free time, I end up putting things off and not getting around to some of the things I would like to do."

When we asked Dr. Robert Carnochan,

director of the Longhorn Band, about his thoughts on the subject, he agreed with Joey's sentiments, and added further to the list of benefits that participation in band can have for students in engineering and science fields: "The thing about music in general, and marching band even more so because of the coordination it involves, is the amount of your brain that is engaged while you are playing an instrument. Music is one of the few fields that can develop both physical and mental dexterity at the same time."

The next thought that came to mind in my personal evaluation of mixing band with engineering was what exactly might bring people back to band, year after year. I've noticed that the longer I'm away from band, the more I find myself missing it. Over the course of the fall 2013 semester I grew used to seeing my Longhorn Band family for practices and performances four days out of the week. Without that same amount of activity and interaction, my spring 2014 semester has been, to say the least, boring.

I asked Joey if he agreed with me on this. What exactly kept him coming back to band every August despite the massive time commitment on top of an already demanding degree plan? His answer was similar to mine: "It's mostly just my friends; most of the people I hang out with are in Longhorn Band. But there's also a thrill of performing that goes along with being in the band, being in front of 100,000 people every week. It's

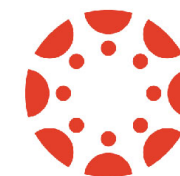
definitely well worth the time I put into it."

Dr. Carnochan, though, best put the "family" aspect of band into words:

"When students get to a school like UT, being part of a group, even if it is a big group, 400 people in the case of Longhorn Band, it is at least smaller than the whole 50,000-person university. People like that family atmosphere. Plus, within the band there are smaller sections, like the drumline or the trumpets. The groups easily get whittled down to 30 or 40 members each, maybe 60 at most. It gives people a core group of friends almost automatically."

It makes sense. I, personally, am a member of the drumline. It's a small group, only thirty-three people. Being part of a group of that size makes finding friends in an eclectic environment like The University of Texas far less daunting. Within the drumline even, there are smaller sections based on instruments: the snares (ten members), the tenors (six members), the cymbals (twelve members), and the basses (better known as the Boom Squad and only five members).

Finally, while it may be a mystery as to why so many engineers are in band, one thing is certain. UT is a big school with an athletic program that is constantly in the national spotlight, so it's easy to understand that more than just music majors are going to want to participate in a spirit organization like Longhorn



canvas

## Blackboard to Canvas

By Khushbu Patel

As we know, UT Austin will be moving to a new Learning Management System called Canvas! Blackboard will be retired on August 31, 2015. There are quite a few reasons for such change, as it will open up to many new possibilities for both students and faculty.

Many believe that Canvas is different than Blackboard. In terms of basic functionality, Canvas is similar to Blackboard. When a student clicks on a course, they are able to view announcements, quizzes, grades, discussions, pages, syllabi, and assignments. However, Canvas allows students to see all information they need on a single page

rather than clicking multiple times to view assignments or grades. Some features even promote out-of-classroom discussions.

**"Canvas is integrated with Google Docs, Facebook, and Skype, allowing information pass more freely between each other."**

Canvas is integrated with Google Docs, Facebook, and Skype, allowing information

pass more freely between each other. Professors may upload assignments via Google Drive and share it amongst their students by using the Google accounts registered. Unlike the Blackboard app, Canvas has the most well developed mobile applications for smart phones and tablets whether it is an Android or iOS operating system. The app is cost free and available to the public.

This fall 2014 to summer 2015, UT courses will be built in Canvas by default. Professors still may use Blackboard, but by fall 2015, Canvas will be the default system for students and professors.

# August 31, 2015



# What Vector is Doing Over the Summer

HENRY  
Internship on an Oil Rig and a Vacation in Paris

ALEX  
Going to the Beach and Traveling

KHUSHBU  
Flying in Zero-G, Internship, and Summer School

Zach  
Summer School and Traveling Abroad

SANDY  
Celebrating Graduation and Traveling

DMITRIY  
Summer School and Job in Austin

RICHARD  
Summer School and PS4

ANVITA  
Internship

KRISTEN  
Summer School

ELIZABETH  
Internship and Summer School

ARLENE  
Business Foundations Certificate Program (TBFSI)

# What Are You Doing This Summer?



A detailed close-up photograph of a mechanical watch movement. The image shows various gears of different sizes, some with teeth visible. There are several jewels, likely sapphires, which appear as small, round, reddish-brown stones. The metal components are polished and have a golden-brown hue. The background is dark, making the intricate details of the watch movement stand out.

**DO  
INCREDIBLE  
THINGS.**

Send your articles and ideas to [vector@sec.engr.utexas.edu](mailto:vector@sec.engr.utexas.edu)